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Before the
Federal Communications Commission
Washington D.C. 20554

ORIGINAL
FILE

In the Matter of	)	
	)	GEN Docket No. 90-314
Amendment of the Commission's	)	ET Docket No. 92-100
Rules to Establish New Personal	)	
Communications Services	)	

To: The Commission

Comments
on a
Notice of Proposed Rule Making

The Wireless Information Networks Forum

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EXECUTIVE SUMMARY

The Wireless Information Networks Forum ("WINForum") supports the Commission's proposal to allocate spectrum to unlicensed User-PCS devices. WINForum urges the Commission to adopt minimum technical rules, based on an industry-developed Spectrum Etiquette, to ensure fair access to, and efficient utilization of, the unlicensed spectrum by equipment from any vendor.

Conformance with the Commission's Rules should be enforced through the equipment authorization process. For nationwide deployment of a variety of unlicensed PCS devices, the allocated spectrum must be cleared of nonconforming operations.

The Commission's proposal to allocate only 20 MHz (1910 to 1930 MHz) for unlicensed PCS does not adequately respond to the needs expressed by many parties, and acknowledged by the Commission in the NPRM, for a wide range of new unlicensed PCS devices.

WINForum is prepared to serve as the industry technical advisory committee to the Commission on unlicensed PCS. This role could include participation in a separate entity that would manage reimbursement of 2 GHz incumbents for costs incurred in reaccommodating their operations.

Reaccommodation of incumbents within the 2 GHz band itself is not only possible, but represents the most practicable means of providing clear spectrum for unlicensed PCS in the foreseeable future.

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Comments on a Notice of Proposed Rule Making

The Wireless Information Networks Forum ("WINForum") is an alliance of leading information technology companies who have been working together to obtain, and effectively employ, radio spectrum for user-provided voice and data personal communications services ("User-PCS").[1] These include wireless local-area networks for computers, cordless telephone systems, and new types of portable information devices and software.

WINForum enthusiastically supports the Commission's proposal to allocate frequencies in the 2 GHz emerging technologies bands for User-PCS services such as wireless PBX systems, cordless telephones, and wireless LANs and other forms of data communications between and among computer systems.[2] The Commission has posed a number of issues regarding the implementation of unlicensed PCS services, including the feasibility of an industry committee negotiating with microwave users to relocate them to frequencies other than those designated for unlicensed services and to reimburse them for their relocation expenses.[3]

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[1] Attachment A is a list of participating companies as of the date of this filing.

2 See proposed §15.253 (a)(1) and (2).

[3] NPRM, GEN Docket No. 90-314, ET Docket No. 92-100 ("NPRM").

WINForum was formed in August, 1991, by information technology companies that are planning to market User-PCS products and services.[4] Started initially by computer companies interested primarily in Data-PCS, WINForum now encompasses a wide diversity of interests, including companies that will become providers of unlicensed voice PCS products and services. Initially, the computer industry did not believe that it was technically feasible for wireless voice and data technologies to share the same frequencies.[5] Today, WINForum is addressing and resolving these issues.

The WINForum technical committee estimates that at least eight staff-years have been expended in meetings alone since mid-1992. Numerous informal and formal contributions by individuals represent additional substantial commitments as well as valuable contributions to the state of the art. WINForum is prepared to accept the Commission's challenge and to serve as the industry-based technical committee that the FCC can rely upon to develop detailed technical requirements for the unlicensed frequencies, including a "Spectrum Etiquette," which will allow the disparate User-PCS applications to share the same frequencies.

WINForum can perform these functions, however, only if three fundamental conditions are met:

- User-PCS devices cannot share frequencies on an entirely unlicensed basis with microwave users without risking unacceptable levels of interference to such users.

- There must be sufficient spectrum for unlicensed PCS services. WINForum estimates that initially 40 to 65 MHz will be needed for all unlicensed PCS services, rather than the 20 MHz proposed by the FCC.

- Frequency access and usage by unlicensed PCS should use FCC rules based on an industry-adopted "Spectrum Etiquette," or set of known interactive behaviors, to which all devices operating in the unlicensed PCS band must conform. Conformance with the Etiquette must be assured through the equipment authorization process.

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[4] See WINForum Comments in ET Docket No. 92-9.

[5] See,e.g., Apple Petition for Rulemaking, RM 7618 ("Apple Petition"), and Apple Reply Comments at 4, filed May 10, 1992.

DISCUSSION

I. Unlicensed PCS Cannot Share Spectrum With Existing Microwave Users On a Co-Primary Basis.

The Commission's central premise in proposing a regulatory structure for unlicensed PCS, particularly the proposed technical requirements, "is to ensure that interference between PCS and existing microwave systems is minimized to the greatest extent possible."[6] While this goal is shared by WINForum and others, the Commission is incorrect in its premise that technical standards can minimize interference between unlicensed PCS and microwave stations. There is no way to ensure interference-free operation if the User-PCS devices are entirely unlicensed while co-primary sharing of spectrum is permitted.

Although the Commission seems to accept the fact that sharing between User-PCS and fixed microwave stations is not feasible,[7] in that it has selected lightly loaded microwave frequencies for the unlicensed services, this position is contradicted by the Commission's proposal "that unlicensed PCS operation be co-primary with Part 94 operations [but] such devices may not cause harmful interference to [incumbents]."[8]

Three principal factors make it impossible for unlicensed PCS to guarantee against interfering with microwave users:

- the susceptibility of fixed microwave receivers to interference;
- Mobile/portable unlicensed PCS devices; and
- The lack of any workable scheme to permit User-PCS devices to avoid transmitting in the presence of microwave receivers.

A. Interference Susceptibility Of Fixed Microwave Receivers

Microwave links are designed and installed to achieve signal margins referenced to the internal (thermal) noise threshold of the system. Microwave stations are geographically and frequency coordinated to assure that no interfering signal can arrive

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[6] NPRM at 121.

[7] "..[W]e believe that proposed unlicensed services will require relatively clear spectrum.. We believe that this approach is appropriate and will eliminate or minimize, as much as practicable, the need for coordination between private fixed microwave systems and unlicensed operations." NPRM at 43, footnote 30.

[8] NPRM at 43.

at the receiver's antenna terminal from another link above a specified threshold, on-channel (or on a nearby channel, albeit at a different threshold). Such geographical and frequency coordination, however, is impossible to achieve in real time with portable PCS devices which are, by design, capable of being used anywhere. Antennas and receivers of microwave links are very sensitive. While their antennas are relatively directional, these stations are widely sensitive to emissions in their surroundings. In fact, microwave antennas do not provide complete discrimination against an interferer at any axis. Even a single portable PCS device, when transmitting, could cause interference above the levels allowed by Part 94 of the Rules and EIA/TIA Bulletin TSB10-E[9] if it is in an area, the size of which could be as much as 50 to 80 square miles, near a microwave receiver.

B. Mobile/Portable User-PCS Devices.

The findings above do not contradict the validity of certain sharing proposals for licensed PCS.[10] All 2 GHz microwave channels are not used in all geographic areas and, therefore, PCS signals on those unoccupied channels can cause no harm. Most proposals to share 2 GHz microwave channels with licensed PCS are based upon "avoidance" schemes, which identify and use those otherwise unoccupied channels. These licensed PCS systems or devices have base stations that operate within particular locations (and it may be appropriate to license them accordingly). Each fixed base station can be imprinted with local microwave frequency usage information. The base stations thus can manage the channels used by portable stations to "avoid" microwave receivers, accomplishing a form of geographical frequency coordination.

Unlicensed User-PCS, in contrast, cannot be limited to circumstances in which there are permanently fixed base stations or other transmission infrastructure. While some user-provided systems have fixed infrastructures, the operations and benefits of cordless, mobile/portable devices and fixed-infrastructure systems are intertwined and not amenable to different frequency allocation, assignment and regulation within the context of an unlicensed structure. Market imperatives suggest, however, that it may be desirable to allow for early deployment within the User-PCS band subject to provisional authorizations at particular locations, which could expire upon band clearing.[11]

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9 "Interference Criteria for Microwave Systems in the Private Radio Services."

10 Such as the "FAST" proposal by American Personal Communications.

11 For example, such authorizations could be pursued under FCC Rules Part 5.

C. There Is No Feasible Avoidance Scheme For Unlicensed Mobile/Portable Devices.

In a workable avoidance scheme, the mobile/portable PCS device must itself be able to determine which microwave channels are in use in the location in which the device finds itself and to avoid those channels when it transmits. However, only the microwave transmitter can be detected and thus avoided; the receiver does not provide any electronic evidence of its presence. Moreover, the microwave transmitter is not always transmitting, nor does it transmit according to a predictable schedule. Thus, a mobile/portable unit cannot rely on avoidance methodology to "listen" for a clear frequency and transmit only if the frequency is silent, because that silence may be temporary.

For an unlicensed PCS device to be able to detect all pertinent microwave transmissions so as to avoid creating interference, it would have to be as sensitive as the microwave receiver it endangers, and also thus would require as high gain and as powerful an antenna as the microwave system.

Its sensing and processing systems would have to be carefully (and expensively) designed to avoid being confounded by rapid momentary fades, multipath and shadowing of fixed service signals, as many User-PCS devices would encounter constantly in their operating environments.

Furthermore, the device's antenna would have to cover all directions at any given moment to be sure of detecting all of the transmissions on a particular frequency. This degree of performance sophistication is difficult in any context, and certainly not practicable in a consumer product that is intended to be highly mobile and portable.

II. The Commission Must Allocate More Spectrum For Unlicensed PCS Than The 20 MHz Proposed In The NPRM.

The Commission's proposal to allocate only 20 MHz (1910 to 1930 MHz) for unlicensed PCS services[12] does not adequately respond to the needs expressed by many parties, and acknowledged by the Commission in the NPRM, for a wide range of new unlicensed PCS services. There is an immediate need for an initial allocation at least 40 to 65 MHz in the 2 GHz band for such services. In contrast with the Commission's proposal for only 20 MHz for unlicensed PCS, European authorities

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[12] See NPRM proposed §§15.253 (b)(1) and (2)).

have allocated 20 MHz in the 2 GHz band (with another 30 MHz in reserve; 50 MHz total) for Digital European Cordless Telecommunications ("DECT"), which is intended to offer wireless PBX services and a limited data connectivity capability.[13] European authorities also are planning to provide 150 MHz or more of spectrum in the 5 GHz range exclusively for High Performance European Radio LAN ("HIPERLAN").

Although it may ultimately become necessary for the Commission to allocate additional frequencies other than those at 2 GHz for specialized unlicensed PCS services such as high-speed LANs, the *sine qua non* for effective, immediate deployment of unlicensed PCS is an adequate allocation in the 2 GHz band. Unless there is sufficient spectrum at 2 GHz, there will be no synergy between User-PCS and the licensed PCS services, which many WINForum members are counting upon to develop products and services that will make a seamless transition between the two.

As discussed below, within the 2 GHz band proposed for PCS, two of the unlicensed services referenced in the NPRM — unlicensed wireless PBX systems, and data communications among people using computer systems — each requires substantially more spectrum than 20 MHz, as shown below. The third — cordless telephones — requires yet another increment of spectrum, estimated to be on the order of 5 MHz. While WINForum's Spectrum Etiquette will enable these disparate services to share the same spectrum so that the composite bandwidth requirements are less than the sum of the parts, no one can reasonably expect spectrum that is inadequate for any one service to suffice for all services combined. Furthermore, the Etiquette itself will not have this "trunking efficiency" if there is too little spectrum devoted to the many User-PCS applications and technologies.

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[13] DECT's data-handling capacity is not as copious as U.S. computer users demand. It is a fraction of the equivalent of a single Ethernet network.

A. Spectrum requirements for unlicensed wireless data communications between computer systems, alone, exceed 20 MHz.

Wireless LANs serve high densities of users in a small area, such as an office, business complex or school. Individuals in our information-based society increasingly need and make use of high data transfer rates of many megabits per second, which is characteristic of computer-to-computer communications such as Ethernet and Token Ring — two of the most popular computer networks. Wireless equivalents of these networks could require more than 10 MHz of RF bandwidth to provide functionality of a single such wired connection. The Commission's proposal is simply not responsive to the rapid growth of computers and computer networks.

B. Spectrum requirements for unlicensed wireless PBXs, alone, exceed 20 MHz.

Estimates of the amount of spectrum needed for wireless PBXs — Wireless Telephony Office Systems ("WTOS") — to serve business PBX users who may be equivalent in population density to computer LAN users, are in similar magnitudes. Rolm Systems has provided calculations showing that 45 MHz is needed for WTOS.[14] Rose Communications, Inc.[15] and International Mobile Machines Corporation[16] made similar showings and cited a need for 40 MHz for WTOS. Ericsson Corporation justified an allocation of 50 MHz in the 2 GHz band for Business PCS.[17]

C. Spectrum requirements for cordless phones, alone, may be in the range of 5 MHz.

Several proceedings from the 1980s to the present have addressed the needs for frequencies for cordless telephones.[18] The proliferation of these unlicensed devices, even now still numbering more than ten times the quantity of cellular telephones in service, validates the public's demand for short-range unlicensed, fee-free wireless communications.

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[14] Rolm Comments in Docket No. 92-9 filed June 8, 1992, at 11.

[15] Rose Comments in Docket No. 92-9 filed June 8, 1992, at 10-11.

[16] IMM Comments in Docket No. 92-9 filed June 8, 1992, at 7.

[17] Ericsson Corporation, Comments on Gen Docket 90-314 filed in response to presentations at the FCC's en banc hearing at 12.

[18] For example, the Petition for Rulemaking filed by TIA/PCS on April 30, 1990, calling for additional 46/49 MHz channels for cordless phones. GTE, in a compelling presentation on GEN Docket 90-314, also appends a library of press articles reflected the success of and demand for cordless telephones.

To the extent that the cordless telephones provided for in the NPRM meet the definition of such devices in Part 15 of the FCC Rules[19] and also comply with the Spectrum Etiquette, WINForum supports making the unlicensed PCS band available for cordless phones. The spectrum demand for new cordless phones in this band may be similar to that of the existing 46/49 MHz phones and the new 900 MHz cordless phones,[20] or under some circumstances or definitions, the demand may be equivalent to that of small cordless PBXs. That is, it could be in the range of 5 MHz.

III. WINForum is Prepared to Act As an Industry Committee For the Unlicensed PCS Band.

The Commission has identified many critical tasks that could be performed by an industry committee with competence to act with respect to the unlicensed PCS bands. These tasks include "serving as a focus for negotiating the relocation of existing Part 94 microwave users,"[21] managing the reimbursement of the expenses incurred in reaccommodation, and addressing the detailed technical issues that the Commission and others have identified as needing resolution before unlicensed PCS can be implemented.[22] WINForum is addressing these detailed technical issues, and is prepared to assist in the formation of a reaccommodation entity to negotiate with incumbents.

A. Negotiation Of And Reimbursement For The Reaccommodation Of Part 94 Microwave Users.

In order to make spectrum available for PCS, the Commission contemplates a negotiation process that would lead to accommodation of microwave users on other frequencies.[23] The Commission states that the band designated for unlicensed operations, 1910-1930 MHz, "can be made available for unlicensed operations with minimal impact on the private fixed microwave community,"[24] and shows that the

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19 47 C.F.R. §15.3 (j).

20 Operating under §15.247 or §15.249 of the Rules.

21 NPRM at 124.

22 Id.

23 First Report and Order and Third Notice of Proposed Rulemaking, ET Docket No. 92-9.

24 NPRM at 43.

band is relatively lightly loaded.[25] While WINForum believes that there are more users there than suggested by the Commission's tabulation, it concurs that the 1910-1930 MHz band has the lowest usage in the 1850-1990 MHz range.[26] As noted above, additional spectrum — e.g., to provide a total of 50 MHz — also must be cleared for successful deployment of unlicensed PCS. To clear the band 1895-1910 MHz would involve moving (approximately) 1267 additional stations, and in the band 1880-1895 MHz approximately 773 more. Approximately 2490 present licensees, therefore, must be reaccommodated to clear 50 MHz of spectrum for unlicensed PCS.[27]

There are a number of issues pertaining to the migration of microwave users from the spectrum designated for unlicensed PCS; the comparative reliability of microwave links operating at 6 GHz seems to be the major point of uncertainty. The Commission has addressed the regulatory aspects regarding access to other bands, and has proposed extremely rigorous requirements to be met by licensed PCS providers seeking relocation of present users, to assure continuation of reliable service.[28] It is not clear, at this point, whether Part 94 users will be relocated to the 6 GHz band, to the Federal government bands at 1710-1850 MHz, or will be reaccommodated within the 2 GHz band. Despite these uncertainties, WINForum will proceed on the basis of the following understandings.

1. Relocation to 6 GHz.

The costs of relocating a single present 2 GHz user to the 6 GHz band may reach to hundreds of thousands of dollars. The spectrum must be cleared for unlicensed PCS to be implemented nationwide. WINForum members cannot

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[25] Id. "[T]he band is relatively lightly loaded...[C]urrently there are only 28 microwave receivers in the 1910-1930 MHz band located within a 10 mile radius of the top 50 MSAs."

[26] Various databases appear to show that there are approximately 436 to 452 receivers and passive repeaters in the 1910-1930 MHz band. Of these, all but a handful -- perhaps as few as eight -- are duplex systems operating under waivers of the FCC Rules Part 94, which calls for simplex operation on these frequencies. (In Part 94 of the Rules, channels are designated by their center frequencies and bandwidths. These tabulations are of the licensees occupying those frequency domains, which may include only part of a channel.)

[27] As many as one-fifth of the present licensees in the subject bands may be described as "public safety and special emergency radio services -- including state and local governments, police, fire and medical emergency communications" licensees, which the Commission has proposed to make immune to mandatory relocation to 6 GHz bands. Appendix A, First Report and Order and Third Notice of Proposed Rule Making on ET Docket 92-9, at 94.59 (b).

[28] Id.

realistically contemplate either the costs of relocation of all microwave users to 6 GHz, or the associated time delays before unlicensed PCS can be deployed. Case-by-case examination of moving particular present users to 6 GHz, however, is well within the scope of WINForum, and where there are no alternatives, such moves can be reimbursed, as indicated below.

2. Relocation to Adjacent Government Frequencies.

For displaced 2 GHz microwave users for whom 6 GHz frequencies may be technically inappropriate, the 1710-1850 MHz band would be attractive from the standpoints of system reliability and cost effectiveness. Costs of such moves could be much lower than relocation to 6 GHz; estimates are in the range of several hundred dollars to perhaps $10,000 per station for the costs of retuning, engineering and associated efforts. WINForum believes this merits continued study and discussion with NTIA.

3. Reaccommodation Within the 1850-1990 MHz Band.

WINForum and other parties have previously suggested that some present users could be reaccommodated within the 1850-1990 MHz band, thereby clearing frequencies for unlicensed PCS.[29] Many studies demonstrate that much of the 1850-1990 MHz band is unoccupied in much of the country, but that different frequencies are unoccupied in different locations. Providing sufficient corresponding frequencies throughout the country by reaccommodating present users in other parts of the same band, while complying with Bulletin 10E or other suitable technical standards, requires computation-intensive methodologies applied to sound microwave engineering techniques. WINForum believes that such measures are not only possible, but represent the most practicable means of providing clear spectrum for unlicensed PCS in the foreseeable future.

The advantages to present users of clearing spectrum by reaccommodation within the band are the same as those of moving to adjacent government spectrum: there are no uncertainties about the effects of propagation on reliability. Of advantage

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[29] WINForum Reply Comments, ET Docket No. 92-9, p. 3. Also see Apple Petition at 22: "Phased release of frequencies also could allow existing users of the frequencies to re-tune their radios within the band, rather than shift to other bands immediately, thereby reducing the costs of transition. Ad-hoc industry agreements providing for compensation to existing users could expedite the process."

to those asking for this reaccommodation, the cost would be a fraction of the costs otherwise required to reassign stations to 6 GHz, and the timetable for clearing frequencies would depend only upon the task of changing the operating frequencies of specific transmitters and receivers, not on constructing, equipping and proving new sites. It will not be possible to reaccommodate all stations within the band, but it appears possible to clear substantial amounts of spectrum by this process, while reassigning only a relative handful of stations to 6 GHz and the 1710-1850 MHz range. The overall costs of quickly clearing spectrum for unlicensed PCS may therefore be in the millions, not billions, of dollars.

B. The Ability Of the Reaccommodation Entity to Negotiate with Incumbents Depends Upon Use of The Commission's Equipment Authorization Process As An Enforcement Mechanism.

WINForum is considering a number of mechanisms to enable manufacturers of User-PCS equipment to pay fees to a reaccommodation entity which would reimburse the reasonable reaccommodation expenses of microwave users, without imposing inappropriate burdens on vendors.[30] The reaccommodation entity could collect and disburse funds, but, if this were entirely a voluntary payment mechanism, there inevitably would be some who would attempt to offer unlicensed PCS devices for sale without contributing to the fund. While there are any number of approaches to dealing with this problem, they all have in common reliance on the FCC's equipment authorization process to enforce the manufacturer's obligation to make payments into the fund administered by the reaccommodation entity. That is, unlicensed PCS equipment manufacturers would not be able to secure the requisite FCC equipment authorization unless they had made a payment to the entity to compensate the entity for its expenses incurred in clearing the unlicensed PCS band, and had obtained the associated unique identifiers.

WINForum believes that, based on the precedent of the private radio frequency coordinating committees, which operate pursuant to Section 331(b)(1) of the Communications Act, the Commission has the ability to impose such a requirement.[31]

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[30] Transmitter identifications could be of use in the administration of the fees. Such a scheme was suggested in Apple's Petition at 27-28. Similarly, standardized hardware-based identification is used in the 900 MHz personal radio service in Japan.

[31] Section 331(b)(1) of the Communications Act authorizes the Commission "to utilize assistance furnished by advisory coordinating committees" in connection with "coordinating the assignment of frequencies

IV. The Commission Should Promulgate Minimal Technical Rules for Unlicensed PCS, Based On An Industry-Adopted Spectrum Etiquette.

The Commission has stated that "The principal intent of our technical requirements is to ensure that the interference between PCS and existing microwave systems is minimized to the greatest extent possible."[32] In particular, the proposed power limits for unlicensed devices and the channelization plan are explicitly designed to create a minimal impact on microwave users. The parties are invited to comment on channelization plans in light of the Commission's "desire to provide protection to incumbent fixed microwave licensees and flexibility for unlicensed PCS devices."[33]

Co-primary sharing between microwave users and unlicensed PCS users is not feasible. The Commission's technical proposal for unlicensed PCS is skewed to achieve an illusory goal: that of minimizing interference to microwave users. Since that goal will be achieved completely by clearing microwave users from the unlicensed PCS band, the Commission is free to develop a regulatory regime that serves only the goal of maximizing flexibility for unlicensed PCS users.

A. FCC Rules Based on WINForum Spectrum Etiquette Will Promote Effective Use of Spectrum

Effective use of unlicensed spectrum requires a minimal set of rules, providing a framework for coexistence of devices from multiple manufacturers, delivering many different types of service. This set of rules is referred to as an Etiquette. Special attention has been given to the issues of interaction between voice-oriented and packet-data-oriented systems.

It is the goal of the Etiquette to allow devices from different manufacturers to coexist in an interference-limited environment by constraining all devices to a known behavior pattern, enforced through equipment authorization. The Etiquette does not address interoperability. The Etiquette utilizes energy detection techniques rather than the exchange of encoded information.

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to stations in the private land mobile services *and the fixed services* (as defined by the Commission by rule)." (*Emphasis* added).

[32] NPRM at 121.

[33] Id. at 45.

It is an intent of the Etiquette to promote innovation, while still encouraging spectrum efficiency. It is anticipated that systems built from devices that meet this Etiquette will see some performance loss when operated in proximity to dissimilar but compliant systems. This is a preferred choice, given the complexity of providing the ultimate in spectral efficiency in mixed-system situations.

There is a strong relationship between the amount of spectrum available and the quality and quantity of service. Even though the Etiquette has been designed for a limited amount of spectrum, there will be substantial performance limitations unless additional spectrum is provided. The Etiquette has been designed to allow for increasing amounts of spectrum.

B. Etiquette Approach is Consistent with FCC Goals

In discussing the possibility of an industry committee that would be capable of developing detailed technical requirements for unlicensed PCS, the Commission stated that such a committee "might investigate the desirability of designing unlicensed PCS equipment with adaptive power controls or with the capability to automatically monitor the spectrum and prevent transmission if the spectrum is occupied."[34]

WINForum is taking precisely this approach in order to accomplish its own and the Commission's goals of maximizing the flexibility for unlicensed PCS devices. The Etiquette WINForum is developing will promote spectrum efficiency and sharing of frequencies by a wide variety of unlicensed products.[35] The Commission should utilize this Etiquette in adopting minimal technical rules sufficient to ensure fair access to, and efficient utilization of, the unlicensed spectrum by equipment from any vendor.

One of the most difficult aspects of spectrum management is deciding just how much spectrum to allocate to various services. Traditional spectrum managers assigned and protected discrete "channels" for specific uses and users. This was effective to the extent the service area was also defined. For unlicensed PCS, the service range of a particular user can be very small (20 to 100 meters), while another user 200 meters

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[34] NPRM at 124.

[35] The WINForum Spectrum Etiquette, however, cannot be employed to enable co-primary sharing between fixed microwave stations and unlicensed PCS devices. No sharing etiquette can function unless all the devices operating in the spectrum band are capable of adhering to the etiquette and microwave stations cannot adhere to the etiquette.

away may have entirely different traffic requirements.

WINForum's Spectrum Etiquette addresses the anomalies and inefficiencies that could result, for example, if the unlicensed PCS band were firmly divided into voice and data subbands, respectively. In many locations, voice services may be the only ones implemented, and vice versa. In these cases, exclusion of one service from otherwise unused spectrum would not be an efficient use of spectrum.

WINForum's Spectrum Etiquette supports spectrum efficiency by allocating frequencies and dynamically sharing time on each frequency. By this means, the total spectrum required to be allocated for all three of the services described in the NPRM (cordless PBXs, wireless LANs and cordless telephones) will typically be less than the sum of the requirements for each function.

WHEREAS, the Wireless Information Networks Forum urges the Commission to allocate spectrum for unlicensed User-PCS devices in accordance with the views expressed herein.

Respectfully submitted,
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APPENDIX A

WINForum Participants to Date

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Altamont Research
Apple Computer
AT&T
Cabletron Systems
California Microwave
Digital Equipment Corp.
Ericsson Business Communications
Farallon Computing
GEC Plessey Semiconductor
GRiD/Tandy Corp.
Hewlett-Packard
IBM
Intel
LACE
M/A-COM
Microsoft
Motorola
National Semiconductor
NCR
Northern Telecom
O'Neill Communications
Protocol Systems
Rockwell International
ROLM Systems
Rose Communications
Salient Communications
SpectraLink
SRI International
Sun Microsystems
Tandem Computers
Tetherless Access
Traveling Software
Ungermann-Bass
Windata
Xircom